EPA/ROD/R04-88/037
1988

EPA Superfund
Record of Decision:

WAMCHEM, INC.
EPA ID: SCD037405362
OU 01
BURTON, SC
06/30/1988

3-NITRO, 4-METHYLBENZAMIDE;
4-AMINOBENZAMIDE; 4-NITROBENZAMIDE; 3-NITRO, 4-METHYLBENZOIC ACID;
3-NITRO, 4-METHYLBENZAMIDE; SECONDARY-BUTYL, NITROBENZENE, AND
4-NITROBENZOIC ACID.

THE WAMCHEM SITE WAS PLACED ON THE NATIONAL PRIORITIES LIST IN SEPTEMBER 1983 DUE TO THE PRESENCE OF POTABLE WATER WELLS WITHIN A THREE MILE RADIUS OF THE SITE. EPA AND M. LOWENSTEIN COMPANY SIGNED A RI/FS CONSENT AGREEMENT ON APRIL 16, 1986. THE FINAL RI WAS ISSUED APRIL 21, 1987 AND THE DRAFT FS WAS RELEASED TO THE PUBLIC MAY 16, 1988.

THE OBJECTIVES OF THE SITE INVESTIGATION WERE TO;

- CHARACTERIZE AND QUANTIFY CONTAMINATION ATTRIBUTABLE TO THE WAMCHEM SITE IN GROUNDWATER, SOILS, SURFACE WATER, BOTTOM SEDIMENTS IN MCCALLEYS CREEK AND SURFACES OF ON SITE BUILDINGS.

- BETTER DEFINE THE GEOLOGY AND HYDROLOGY IN THE VICINITY OF THE SITE, ESPECIALLY WITH RESPECT TO THE INTER RELATIONSHIPS AMONG MCCALLEYS CREEK, THE WATER TABLE AQUIFER, AND THE FLORIDAN AQUIFER WITH AN EMPHASIS ON THE PROBLEM OF DEFINING CONTAMINANT TRANSPORT.

- ASSESS THE RISKS THAT CONTAMINANTS ATTRIBUTABLE TO THE SITE POSE TO HUMAN HEALTH AND THE ENVIRONMENT.

THE PURPOSE OF THE FEASIBILITY STUDY WAS TO DEVELOP AND EXAMINE REMEDIAL ALTERNATIVES FOR THE SITE, AND TO SCREEN THESE ALTERNATIVES ON THE BASIS OF PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT, COST-EFFECTIVENESS AND TECHNICAL IMPLEMENTABILITY. IN ACCORDANCE WITH THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT OF 1980 (CERCLA), AS AMENDED BY THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA), ALTERNATIVES IN WHICH TREATMENT WOULD PERMANENTLY AND SIGNIFICANTLY REDUCE THE VOLUME, TOXICITY, OR MOBILITY OF THE HAZARDOUS SUBSTANCES AT THE SITE WERE PREFERRED OVER THOSE ALTERNATIVES NOT INVOLVING SUCH TREATMENT.

#EA
2.0 ENFORCEMENT ANALYSIS

THE WAMCHEM SITE WAS ADDED TO THE NPL IN SEPTEMBER 1983 AND EPA ASSUMED LEAD RESPONSIBILITY FOR THE SITE AT THAT TIME. THE CURRENT OWNER, SPRINGS INDUSTRIES, ACQUIRED THE SITE IN 1985 AND AGREED TO PERFORM THE RI/FS. A NOTICE LETTER WAS SENT TO SPRINGS INDUSTRIES ON JANUARY 15, 1986. NEGOTIATIONS FOR THE RI/FS CONSENT AGREEMENT WERE CONCLUDED WITH THE SIGNING OF THE DOCUMENT BY BOTH EPA AND M. LOWENSTEIN COMPANY ON APRIL 16, 1986.

#CSS
3.0 CURRENT SITE STATUS

3.1 HYDROGEOLOGIC SETTING

THE WAMCHEM SITE IS GENERALLY LOCATED DOWNGRADIENT OF A BASIN RIDGE COINCIDENT WITH THE NORTH-SOUTH TREND OF U.S. HIGHWAY 21; THEREFORE ALL SURFACE DRAINAGE FROM THE SITE IS WITHIN THE CONFINES OF THE MCCALLEYS CREEK BASIN. DISCHARGE FROM MCCALLEYS CREEK MAY TAKE SEVERAL ROUTES DUE TO THE CONNECTIVITY OF THE CHANNEL REACHES. THEREFORE THE COOSAW RIVER, BEAUFORT RIVER, WHALE BRANCH, AND BROAD RIVER MAYBE RECIPIENTS OF DISCHARGE FROM MCCALLEYS CREEK. ULTIMATELY, THESE RIVERS ARE CONNECTED TO PORT ROYAL SOUND TO THE SOUTH AND ST. HELENA SOUND TO THE EAST.

THE WATER TABLE AQUIFER AT THE WAMCHEM SITE IS COMPOSED PREDOMINANTLY OF SANDS AND THERE IS NO DISTINCT CONFINING UNIT SEPARATING THE WATER TABLE AQUIFER FROM THE UNDERLYING FLORIDAN AQUIFER. HOWEVER, THE DIFFERENCE IN HYDRAULIC CONDUCTIVITY BETWEEN THE WATER TABLE AQUIFER AND THE FLORIDAN AQUIFER RESULTS IN PARTIAL CONFINEMENT OF THE FLORIDAN AQUIFER BY THE WATER TABLE AQUIFER. THE VERTICAL HYDRAULIC GRADIENT BETWEEN THE TWO AQUIFERS WAS POSITIVE (UPWARD) DURING THE RI FIELD WORK. THIS INDICATES THAT THE WAMCHEM SITE IS IN A ZONE OF DISCHARGE FOR THE FLORIDAN AQUIFER.

IN THE BEAUFORT COUNTY REGION, THE FLORIDAN AQUIFER IS MAINLY COMPOSED OF THE SANTEE AND OCALA LIMESTONES. THE OCALA LIMESTONE IN THE BEAUFORT COUNTY REGION IS MADE UP OF A LOWER AND AN UPPER UNIT. THIS UPPER UNIT IS THE PRINCIPAL AQUIFER IN THE REGION AND WAS ESTIMATED TO SUPPLY OVER 99 PERCENT OF THE GROUNDWATER AND MORE THAN 75 PERCENT OF ALL WATER USED IN BEAUFORT COUNTY IN 1976.

WATER TABLES TEND TO BE VERY SHALLOW IN THE SWAMPY, TO TOPOGRAPHICALLY LOWER ELEVATIONS AND RANGE FROM SURFACE GRADE TO APPROXIMATELY THREE FEET DEEP.

3.2 SITE CONTAMINATION

THE WAMCHEM SITE CONTAINS SIX MAIN AREAS DESIGNATED AS SPRAY FIELD A, SPRAY FIELD B, FORMER WASTE LAGOON, FORMER HOLDING POND, EXISTING HOLDING POND, AND TRASH DISPOSAL AREA. SOIL, GROUNDWATER, SURFACE WATER AND SEDIMENT SAMPLES HAVE BEEN COLLECTED IN AND AROUND EACH AREA AND ANALYZED. ALL SAMPLES HAVE BEEN ANALYZED FOR HAZARDOUS SUBSTANCES LIST (HSL) VOLATILES, SEMIVOLATILES AND METALS.

SOILS

AN ONSITE MOBILE LABORATORY WAS USED TO SCREEN SOIL SAMPLES TAKEN FROM 43 LOCATIONS ON THE WAMCHEM SITE. THE SCREENING PROGRAM ANALYZED 98 SOIL SAMPLES FOR THREE VOLATILE ORGANIC COMPOUNDS (BENZENE, TOLUENE, AND 1,1,2-TRICHLOROETHANE) AND TWO SEMIVOLATILE COMPOUNDS (ANILINE AND NITROBENZENE). THE PURPOSE OF THE SOIL SCREENING PROGRAM WAS TO RAPIDLY ASSESS THE SPATIAL DISTRIBUTION AND CONCENTRATIONS OF THE COMPOUNDS OUTLINED ABOVE.

BASED UPON THE RESULTS OF THE FIELD SCREENING PROGRAM, FIVE SOIL SAMPLES WERE SENT TO A CLP LABORATORY TO BE ANALYZED FOR HSL VOLATILES SEMIVOLATILES AND METALS. THESE WERE S0-20 AND S0-21 (FORMER HOLDING POND), S0-18 (FORMER WASTE LAGOON), S0-30 (PRODUCTION AREA) AND S0-45 (BACKGROUND) (FIGURE 4). RESULTS OF THESE ANALYSES ARE PRESENTED IN TABLE 1 AND SUMMARIZED IN FIGURE 5.

THE RESULTS OF THESE ANALYSES INDICATED THAT THE MAIN AREA OF SOIL CONTAMINATION WAS IN THE VICINITY OF THE FORMER HOLDING POND. ADDITIONAL SOIL BORINGS WERE CONDUCTED IN THIS AREA TO FULLY DELINEATE THE AMOUNT OF SOIL CONTAMINATION. FIGURE 6 SHOWS THE LOCATIONS OF THESE SOIL SAMPLES AND TABLE 2 SUMMARIZES THE ANALYSES RESULTS.

IN ADDITION TO THE HSL VOLATILES AND SEMIVOLATILES, VARIOUS ORGANIC COMPOUNDS NOT BELONGING TO THE HSL WERE DETECTED. TWENTY TENTATIVELY IDENTIFIED COMPOUNDS WERE DETECTED IN S0-20B, RANGING INCONCENTRATIONS FROM A MINIMUM OF 49,000 UG/KG FOR L-ETHYL-3-METHYLBENZENE TO A MAXIMUM OF 2,900,000 UG/KG FOR 7-CHLOROTHIAZOLO (5,4-D) PYRIMIDINE. SOIL SAMPLE S0-21B CONTAINED 15 TENTATIVELY IDENTIFIED COMPOUNDS, WITH A MINIMUM CONCENTRATION OF 15 UG/KG FOR TRICHLOROFLUOROMETHANE TO A MAXIMUM CONCENTRATION OF 380,000 UG/KG FOR A BENZOIC ACID ISOMER.

SURFACE WATER

THE SURFACE WATER SAMPLING LOCATIONS ARE SHOWN ON FIGURE 7. THE RESULTS OF THE ANALYSES DID NOT

REVEAL ANY HSL ORGANIC COMPOUNDS, HOWEVER TEN TENTATIVELY IDENTIFIED COMPOUNDS WERE DETECTED. ALL WERE HYDROCARBONS AND RANGED IN CONCENTRATION FROM 8 UG/L TO 38 UG/L IN SAMPLE SW-4.

SEDIMENT

THE SEDIMENT SAMPLING LOCATIONS ARE SHOWN ON FIGURE 7 AND RESULTS ARE GIVEN IN TABLE 3. THE HIGHEST LEVEL OF CONTAMINATION WAS FOUND IN SAMPLE SE-3. THIS SAMPLE IS DOWNGRADIENT OF THE FORMER HOLDING POND AND CONTAINED METHYLENE CHLORIDE (59 UG/KG), ACETONE (26 UG/KG), BENZENE (1.9 UG/KG), CHLOROBENZENE (180 UG/KG), 1,4-DICHLOROBENZE (190 UG/KG), 1,2-DICHLOROBENZENE (240 UG/KG), AND PYRENE (220 UG/KG). THE SAMPLE ALSO CONTAINED FOURTEEN TENTATIVELY IDENTIFIED HYDROCARBONS RANGING FROM 71 UG/KG TO 920 UG/KG. SE-L IS A BACKGROUND SAMPLE.

ONSITE STRUCTURES

NINE BUILDING WIPE SAMPLES WERE TAKEN FROM ON SITE STRUCTURES AND ANALYZED FOR HSL SEMIVOLATILES AND METALS. TABLE 4 SUMMARIZES THE RESULTS, AND THE LOCATIONS ARE SHOWN ON FIGURE 8.

A TOTAL OF FOUR HSL SEMIVOLATILE COMPOUNDS WERE DETECTED, ALL OF WHICH WERE PHTHALATE ESTERS.

WASTES

DURING THE RI INVESTIGATION, TWO WASTE SAMPLES WERE ENCOUNTERED. ONE (S0-46) WAS A MIXTURE OF SOIL AND RED AND YELLOW MATERIAL OBTAINED IN THE VICINITY OF THE TRASH DISPOSAL AREA. THE OTHER SAMPLE (DM-L) WAS IN A DRUM LOCATED IN ONE OF THE ONSITE BUILDINGS. THE RCRA CHARACTERIZATION ANALYSES FOR THESE SAMPLES (FLASH POINT, REACTIVITY, CORROSIVITY, AND METALS) FOUND THAT THEY DO NOT EXHIBIT THE CHARACTERISTICS OF A HAZARDOUS WASTE.

GROUNDWATER

THE RESULTS OF THE HSL VOLATILE AND SEMIVOLATILE ANALYSES FOR TEN ON-SITE MONITORING WELLS (RI-9 THROUGH RI-7B) AND TEN OFF-SITE RESIDENTIAL SUPPLY WELLS (RI-9 THROUGH RI-23) CAN BE FOUND IN TABLES 5 AND 6, RESPECTIVELY. THE LOCATIONS OF THE ONSITE WELLS ARE SHOWN IN FIGURE 9, AND THE DOMESTIC WELL LOCATIONS ARE SHOWN IN FIGURE 10.

THE DEEP AQUIFER, THE FLORIDAN, DID NOT CONTAIN ANY VOLATILE OR SEMIVOLATILE COMPOUNDS. THE SHALLOW MONITORING WELLS NEAR THE PERIMETER OF THE PRODUCTION AREA AND THE FORMER HOLDING POND SHOWED THE GREATEST AMOUNT OF CONTAMINATION.

THE ANALYSES FOR THE RESIDENTIAL AND COMMERCIAL OFFSITE WELLS DETECTED ONLY TRACE AMOUNTS OF ORGANICS IN THREE OF THE TEN WELLS.

OYSTERS

OYSTER SAMPLES WERE COLLECTED FROM TWO LOCATIONS IN MCCALLEYS CREEK (ONE ADJACENT TO THE SITE) AND TWO BACKGROUND STATIONS (FIGURE 11) AND WERE ANALYZED FOR ACETONE, BENZENE, 1,2-DICHLOROBENZENE, 1,4-DICHLOROBENZENE, 2,4-DINITROTOLUENE, NAPHTHALENE, TOLUENE, 1,2,4-TRICHLOROBENZENE AND XYLENE. THESE ANALYSES WERE CONDUCTED TO DETERMINE WHETHER SITE RELATED CONTAMINANTS WERE BIOACCUMULATING IN THE AQUATIC LIFE. NONE OF THE CONTAMINANTS WERE DETECTED IN ANY OF THE TISSUE SAMPLES. SPLIT SAMPLES TAKEN BY THE U.S. FISH AND WILDLIFE CONFIRMED THESE RESULTS, AND IN ADDITION, FOUND THAT METALS WERE NOT A CONCERN.

3.3 RECEPTORS

BASED UPON THE DATA GATHERED DURING THE RI AND BIOLOGICAL RESOURCES IDENTIFIED ON AND IN THE

VICINITY OF THE SITE, THE POTENTIAL HUMAN AND ENVIRONMENTAL RECEPTORS INCLUDE THE FOLLOWING;

- NEARBY RURAL POPULATION THAT USES GROUNDWATER FOR DRINKING PURPOSES. THESE RESIDENTS RELY ON GROUNDWATER WELLS FOR THEIR WATER SUPPLY.
- NEARBY RURAL POPULATION THAT USES GROUNDWATER FOR DOMESTIC PURPOSES OTHER THAN DRINKING, SUCH AS SHOWERING, BATHING, FOOD PREPARATION, CLOTHES WASHINGS, LAWN OR GARDEN WATERING, ETC.
- RECREATIONAL USERS OF SURFACE WATERS FROM MCCALLEYS CREEK.
- HUMANS CONSUMING GAME ANIMALS (FISH, SMALL ANIMALS) THAT CAN BE CONTAMINATED BY INFESTION OF BIOACCUMULATIVE CONTAMINANTS.
- BOTTOM FEEDERS OF CONTAMINATED SEDIMENT IN MCCALLEYS CREEK AND THEIR POTENTIAL INFLUENCE ON THE FOOD CHAIN.
- THREATENED OR ENDANGERED SPECIES PRESENT IN THE VICINITY OF MCCALLEYS CREEK.
- AQUATIC BIOTA, FAUNA, AND FLORA IN AND AROUND THE SITE THAT MAYBE STRESSED.
- PERSONS THAT COME INTO DIRECT DERMAL CONTACT WITH CONTAMINANTS PRESENT AT THE SITE.
- ONSITE REMEDIATION WORKERS THAT INHALE ELEVATED CONCENTRATIONS OF VOLATILES DURING SOIL DISTURBANCE OR THAT HAVE DIRECT DERMAL CONTACT WITH CONTAMINATED SOIL.

#CC

4.0 CLEANUP CRITERIA

THE EXTENT OF CONTAMINATION WAS DEFINED IN SECTION 3.0, CURRENT SITE STATUS. THIS SECTION EXAMINES THE RELEVANCE AND APPROPRIATENESS OF WATER QUALITY CRITERIA UNDER THE CIRCUMSTANCES OF RELEASE OF CONTAMINANTS AT THIS SITE. BASED UPON CRITERIA FOUND TO BE RELEVANT AND APPROPRIATE, THE MINIMUM GOALS OF REMEDIAL ACTION AT THIS SITE HAVE BEEN DEVELOPED.

4.1 GROUNDWATER REMEDIATION

IN DETERMINING THE DEGREE OF GROUNDWATER CLEANUP, SECTION 121(D) OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA) REQUIRES THAT THE SELECTED REMEDIAL ACTIONS ESTABLISH A LEVEL OR STANDARD OF CONTROL WHICH COMPLIES WITH ALL "APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)".

GROUNDWATER IN THE SURFICIAL AQUIFER AT THE WAMCHEM SITE IS CLASSIFIED AS CLASS I, FOLLOWING METHODOLOGY IN THE FINAL DRAFT OF THE U.S. EPA GROUNDWATER

CLASSIFICATION GUIDELINES OF DECEMBER 1986. CLASS I GROUNDWATERS ARE AFFORDED EXTRAORDINARY PROTECTION DUE TO THE RISK OF FURTHER ENDANGERMENT TO SPECIES DEPENDENT UPON UNIQUE HABITATS.

GROUNDWATER IN THE DEEPER AQUIFER, THE FLORIDAN, IS CLASSIFIED AS CLASS II A USING THE ABOVE CITED GUIDELINES. CLASS II A GROUNDWATERS ARE A CURRENT SOURCE OF DRINKING WATER. HOWEVER, THE DEEP AQUIFER WAS FOUND NOT TO BE CONTAMINATED.

THE SURFICIAL AQUIFER AT THE SITE DISCHARGES INTO MCCALLEYS CREEK. BASED ON REPORTED SIGHTINGS, THE SCIENTIFIC LITERATURE AND SUBSTANTIATING DOCUMENTATION FROM THE U.S. NATIONAL MARINE FISHERIES SERVICE, MCCALLEYS CREEK IS CONSIDERED TO BE HABITAT FOR THE LOGGERHEAD TURTLE

(CARETTA CARETTA), A FEDERALLY LISTED THREATENED SPECIES. A TURTLE SIGHTING IN MCCALLEYS CREEK WAS REPORTED TO EPA IN 1988 BY THE WAMCHEM SITE CARETAKER, WHO HAS LIVED ADJACENT TO THE CREEK FOR NUMEROUS YEARS. OTHER SPECIES OF SEA TURTLES, ALL OF WHICH ARE EITHER THREATENED OR ENDANGERED, MAY ALSO BE PRESENT IN THE AREA. AN OFFICIAL SIGHTING OF A KEMP'S RIDLEY TURTLE IN THE VICINITY OF MCCALLEYS CREEK WAS RECORDED BY THE US FISH AND WILDLIFE SERVICE IN 1987. IN ADDITION TO SUPPORTING SEA TURTLES, MCCALLEYS CREEK IS PROBABLE HABITAT FOR THE SHORT-NOSED STURGEON, A FEDERALLY LISTED ENDANGERED SPECIES OF FISH. EQUAL PROTECTION IS AFFORDED TO BOTH THREATENED AND ENDANGERED SPECIES UNDER THE ENDANGERED SPECIES ACT.

THE VALUE TO THE ENVIRONMENT OF CLASS I GROUNDWATER RESOURCES SUPPORTS RESTORATION OF THIS CONTAMINATED GROUNDWATER TO LEVELS PROTECTIVE OF THE ENVIRONMENT. THE GROUNDWATER IS HIGHLY VULNERABLE TO CONTAMINATION AND SUPPLIES A SENSITIVE ECOLOGICAL SYSTEM SUPPORTING A UNIQUE HABITAT. BASED UPON GROUNDWATER CLASSIFICATION, REMEDIATION OF THE GROUNDWATER TO REDUCE CONTAMINANTS TO LEVELS PROTECTIVE OF THE ENVIRONMENT WOULD BE NECESSARY. GROUNDWATER CLEANUP GOALS GIVEN IN TABLE 7 MEET THESE REQUIREMENTS.

THE CONCLUSION OF THE ABOVE DISCUSSION IS THAT A NO-ACTION ALTERNATIVE FOR GROUNDWATER WOULD BE OUT OF COMPLIANCE WITH SECTION 121 OF SARA WHICH REQUIRES CLEANUP OF CONTAMINATED GROUNDWATER TO LEVELS WHICH ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT.

INDICATOR CHEMICALS WERE USED TO ESTABLISH CLEANUP GOALS FOR GROUNDWATER. ALL INDICATOR CHEMICALS ANALYZED FOR IN THE RI WERE UTILIZED IN THE PUBLIC HEALTH EVALUATION. LEVELS PRESENTED AS GROUNDWATER CLEANUP GOALS ARE BASED ON THE FEDERAL AMBIENT WATER QUALITY CRITERIA (AWQC).

4.2 SOIL REMEDIATION

THE PUBLIC HEALTH ASSESSMENT IN THE RI REPORT DETERMINED THAT RISKS TO HUMAN HEALTH AS A RESULT OF EXPOSURE TO ON-SITE CONTAMINANTS VIA INHALATION, INGESTION, AND DERMAL CONTACT ARE LOW UNDER PRESENT USE CONDITIONS AT THE SITE. CONTAMINANTS REMAINING IN THE SOIL WILL, HOWEVER, CONTINUE TO LEACH INTO THE GROUNDWATER. THEREFORE, THE CLEANUP GOALS PRESENTED IN TABLE 8 ARE ESTIMATES OF CONTAMINANT CONCENTRATIONS IN SOIL AT THE WAMCHEM SITE THAT WOULD NOT RESULT IN FUTURE EXCEEDANCES OF AWQC IN GROUNDWATER AT THE SOURCE AREA DUE TO LEACHING OF SOIL CONTAMINANTS.

THE MODEL USED WAS BY SUMMERS (1980) AND ASSUMES THAT A CERTAIN PERCENTAGE OF THE RAINFALL AT THE SITE WILL INFILTRATE THE SITE AND DESORB CONTAMINANTS FROM THE SOIL BASED ON AN EQUILIBRIUM SOIL-WATER PARTITIONING. IT IS FURTHER ASSUMED THAT THIS CONTAMINATED INFILTRATE WILL MIX COMPLETELY WITH A PORTION OF THE GROUNDWATER BELOW THE SITE, RESULTING IN AN EQUILIBRIUM GROUNDWATER CONCENTRATION.

ACCORDING TO THIS MODEL, THE MIXING OF GROUNDWATER AND INFILTRATION AND THE RESULTANT CONTAMINANT CONCENTRATIONS IN GROUNDWATER ARE RELATED AS FOLLOWS;

$$CGW = OP\ CP / QP + QGW$$

WHERE;

CGW - CONTAMINANT CONCENTRATION IN THE GROUNDWATER (UG/L)
QP - VOLUMETRIC FLOW RATE OF INFILTRATION (SOIL PORE WATER) INTO THE GROUNDWATER (FT3/DAY)
QGW - VOLUMETRIC FLOW RATE OF GROUNDWATER (FT3/DAY)
CP - CONTAMINANT CONCENTRATIONS IN THE INFILTRATE (UG/L).

4.3 SURFACE WATER/ SEDIMENT REMEDIATION

NO SURFACE WATER CONTAMINATION (HSL VOLATILES, SEMIVOLATILES) WAS DETECTED IN MCCALLEYS CREEK. WHILE THE CONTAMINANT LEVELS IN THE SEDIMENT (SEE TABLE 3) ARE VERY LOW AND NOT A CAUSE FOR CONCERN, IT IS ANTICIPATED THAT REMEDIATION OF THE CONTAMINANT SOURCE WILL RESULT IN THE DECREASE OF SEDIMENT CONTAMINATION TO ACCEPTABLE LEVELS. THUS, IT WAS CONCLUDED THAT DIRECT REMEDIATION OF THE SURFACE WATER AND SEDIMENT IS NOT NECESSARY.

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5.0 ALTERNATIVES EVALUATION

THE PURPOSE OF REMEDIAL ACTION AT THE WAMCHEM SITE IS TO MITIGATE AND MINIMIZE CONTAMINATION IN THE SOILS AND GROUNDWATER, AND TO REDUCE POTENTIAL RISKS TO HUMAN HEALTH AND THE ENVIRONMENT. THE FOLLOWING CLEANUP OBJECTIVES WERE DETERMINED BASED ON REGULATORY REQUIREMENTS AND LEVEL OF CONTAMINATION FOUND AT THE SITE;

- TO PROTECT THE HUMAN HEALTH AND THE ENVIRONMENT FROM EXPOSURE TO CONTAMINATED ON-SITE SOILS THROUGH INHALATION, DIRECT CONTACT, OR THE LEACHING OF CONTAMINANTS INTO GROUNDWATER.

- TO RESTORE CONTAMINATED GROUNDWATER TO LEVELS PROTECTIVE OF HUMAN HEALTH AND ENVIRONMENT.

AN INITIAL SCREENING OF POSSIBLE TECHNOLOGIES WAS PERFORMED TO IDENTIFY THOSE WHICH BEST MEET THE CRITERIA OF SECTION 300.68 OF THE NATIONAL CONTINGENCY PLAN (NCP) (TABLE 9).

FOLLOWING THE INITIAL SCREENING OF TECHNOLOGIES, POTENTIAL REMEDIAL ACTION ALTERNATIVES WERE IDENTIFIED AND ANALYZED (TABLE 10). THESE ALTERNATIVES WERE FURTHER SCREENED AND THOSE WHICH BEST SATISFIED THE CLEANUP OBJECTIVES, WHILE ALSO BEING COST EFFECTIVE AND TECHNICALLY FEASIBLE WERE DEVELOPED FURTHER (TABLE 11).

5.1 ALTERNATIVES

ALTERNATIVES 1: NO ACTION

THIS ALTERNATIVE WILL EVENTUALLY REDUCE THE VOLUME OF SOIL CONTAMINATION THROUGH NATURAL FLUSHING. CONTAMINANT MOBILITY AND TOXICITY ARE NOT REDUCED IN THE ABSENCE OF TREATMENT. GIVEN THE CONTAMINANT CONCENTRATIONS AT THE SITE, THE TIME REQUIRED TO SIGNIFICANTLY REDUCE CONTAMINANT LEVELS IS UNREALISTIC. NO ACTION DOES NOT PROVIDE PERMANENT SOURCE CONTROL.

ALTERNATIVE 2: EXCAVATION, REMOVAL, AND TRANSPORT OF SOIL, GROUNDWATER MONITORING, PROVISORY GROUNDWATER TREATMENT

THIS ALTERNATIVE WOULD INVOLVE THE EXCAVATION AND REMOVAL OF CONTAMINATED SOIL AND THE TRANSPORT OF THIS SOIL TO AN APPROVED TREATMENT, STORAGE AND DISPOSAL (TSD) FACILITY. THE TECHNOLOGIES WOULD INCLUDE EXCAVATION; DEWATERING OF EXCAVATED SOILS; REMOVAL OF SOILS AND TRANSPORTATION TO A TSD FACILITY; BACKFILLING WITH CLEAN SOIL, AND REVEGETATION.

THIS ALTERNATIVE WOULD MEET SOIL REMEDIAL ACTION OBJECTIVES AND REMOVE THE SOURCE OF CONTAMINATION ONSITE BUT WOULD NOT DESTROY IT. THUS, IT IS NOT CONSIDERED A PERMANENT REMEDY.

QUARTERLY MONITORING OF GROUNDWATER AT THE 10 EXISTING WELLS, AND THREE ADDITIONAL WELLS AND SURFACE WATER IS RECOMMENDED FOR A PERIOD OF FIVE YEARS. AFTER THIS, ANNUAL SAMPLING SHOULD BE SUFFICIENT. INCLUDED IN THIS ALTERNATIVE IS A PROVISION THAT GROUNDWATER TREATMENT WOULD BE INITIATED UPON DETECTION OF ANY SITE RELATED CONTAMINANTS IN THE SURFACE WATER.

THE ARARS FOR GROUNDWATER AT THIS SITE ARE THE AMBIENT WATER QUALITY CRITERIA. GROUNDWATER MONITORING WILL NOT REDUCE THE LEVEL OF CONTAMINATION IN THE GROUNDWATER AND THEREFORE, WOULD NOT MEET THE GROUNDWATER ARAR.

ALTERNATIVE 3: LOW TEMPERATURE THERMAL AERATION OF SOIL, GROUNDWATER MONITORING, PROVISORY GROUNDWATER TREATMENT

THIS ALTERNATIVE WOULD INVOLVE THE EXCAVATION, TREATMENT AND BACKFILLING OF CONTAMINATED SOILS. THE TECHNOLOGIES WOULD INCLUDE EXCAVATION; LTTA OF SOILS, BACKFILLING OF TREATED SOILS; AND REVEGETATION.

THE SYSTEM HAS PROVED HIGHLY RELIABLE IN PILOT TESTS AND IS AVAILABLE AS A COMPLETE SYSTEM, MAINTAINED AND OPERATED BY THE PATENT OWNER. PERIODIC SAMPLING DURING EXCAVATION IS REQUIRED TO DETERMINE WHETHER REMEDIAL ACTION OBJECTIVES ARE BEING MET, AS WELL AS WHETHER OPTIMUM SYSTEM OPERATING PARAMETERS ARE BEING MAINTAINED. THE LTTA PROCESS FOR SOILS DOES NOT MEET THE DEFINITION OF AN INCINERATOR UNDER RCRA AND THEREFORE IS NOT SUBJECT TO INCINERATION PERFORMANCE STANDARDS. FOLLOWING THE LTTA PROCESS, SOILS WILL BE REDEPOSITED ONSITE. TREATMENT TIME IS ESTIMATED TO TAKE ONE YEAR.

ALTERNATIVE 4: INCINERATION OF SOIL, GROUNDWATER MONITORING, PROVISORY GROUNDWATER TREATMENT

THIS ALTERNATIVE WOULD INVOLVE THE ONSITE INCINERATION OF EXCAVATED CONTAMINATED SOIL UTILIZING A MOBILE INCINERATION UNIT, THE SUBSEQUENT BACKFILLING OF CLEAN ASH IN THE EXCAVATED AREA, AND REVEGETATION OF THE DISTURBED AREA.

THE SYSTEM REQUIRES TRAINED OPERATORS DURING TREATMENT, AND ON-SITE ASH TESTING WILL BE REQUIRED TO ENSURE THAT CONTAMINANT DESTRUCTION IS COMPLETE. MOBILIZATION AND DEMOBILIZATION OF THE MOBILE INCINERATION UNITS IS A MAJOR PORTION OF THE TIME AND EXPENSE. MANY SYSTEMS REQUIRE CRANES, RIGGERS, PAD CONSTRUCTION, AND TRAINED PERSONNEL FOR ASSEMBLY.

TREATMENT TIMES WOULD RANGE FROM 1-2 MONTHS, NOT COUNTING MOBILIZATION/DEMOBILIZATION TIME.

ALTERNATIVE 5: EXCAVATION, REMOVAL, AND TRANSPORT OF SOIL, AIR STRIPPING AND CARBON ADSORPTION OF GROUNDWATER.

THIS OPTION WOULD INVOLVE THE AIR STRIPPING OF EXTRACTED GROUNDWATER FOLLOWED BY CARBON ADSORPTION. FOR THE CONTAMINANTS FOUND IN THE GROUNDWATER AT THE WAMCHEM SITE, NEITHER ACTIVATED CARBON ADSORPTION NOT AIR STRIPPING COULD BE USED SINGLY AS A COMPLETE TREATMENT. THE TWO PROCESSES ARE FREQUENTLY COMBINED, USUALLY RESULTING IN A MORE ECONOMICAL AND FEASIBLE SYSTEM THAN EITHER ONE ALONE.

THE USEFUL LIFE OF THE COMBINED SYSTEM, ASSUMING PROPER OPERATION AND MAINTENANCE, SHOULD BE APPROXIMATELY 20 YEARS, BUT THE TREATMENT SYSTEM IS ONLY PREDICTED TO BE IN USE FOR 10 YEARS.

TREATED GROUNDWATER WOULD BE DISCHARGED IN MCCALLEYS CREEK PURSUANT TO STATE WATER POLLUTION CONTROL REQUIREMENTS.

ALTERNATIVE 6: LOW TEMPERATURE THERMAL AERATION OF SOIL AIR STRIPPING AND CARBON ADSORPTION OF GROUNDWATER.

THIS ALTERNATIVE WOULD PROVIDE A PERMANENT REMEDY FOR BOTH SOIL AND GROUNDWATER. BOTH TREATMENTS HAVE BEEN DESCRIBED EARLIER.

ALTERNATIVE 7: INCINERATION OF SOIL, AIR STRIPPING AND CARBON ADSORPTION OF GROUNDWATER.

THIS ALTERNATIVE WOULD PROVIDE A PERMANENT REMEDY FOR BOTH SOIL AND GROUNDWATER. BOTH TREATMENTS HAVE BEEN DESCRIBED EARLIER.

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6.0 RECOMMENDED ALTERNATIVES

6.1 DESCRIPTION OF RECOMMENDED REMEDY.

THE RECOMMENDED ALTERNATIVES FOR REMEDIATION OF GROUNDWATER AND SOIL CONTAMINATION AT THE WAMCHEM SITE INCLUDE EXTRACTION, TREATMENT AND DISCHARGE OF GROUNDWATER; AND ON-SITE TREATMENT OF CONTAMINATED SOIL (ALTERNATIVE 6).

THESE RECOMMENDED ALTERNATIVES MEET THE REQUIREMENTS OF THE NATIONAL OIL AND HAZARDOUS SUBSTANCES CONTINGENCY PLAN (NCP), 40 CFR 300.68 (J), AND THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA). THIS RECOMMENDED REMEDY PERMANENTLY AND SIGNIFICANTLY REDUCES THE VOLUME OF HAZARDOUS SUBSTANCES IN THE GROUNDWATER, AND REDUCES THE VOLUME OF CONTAMINANTS IN THE SOIL.

6.2 OPERATION AND MAINTENANCE

WHEN THE REMEDY IS COMPLETED NO LONG-TERM OPERATION AND MAINTENANCE (O&M) WILL BE REQUIRED.

6.3 COST OF RECOMMENDED ALTERNATIVES

CAPITAL COSTS FOR GROUNDWATER REMEDIATION IS $414,900 WITH SYSTEM OPERATING AND MAINTENANCE COST AT $155,100 PER YEAR, WHICH INCLUDES SAMPLING AND ANALYSIS. THE TOTAL PRESENT WORTH OF THE GROUNDWATER REMEDIATION IS $1,203,200. THE LTLA PROCESS IS BASED ON THE EXCAVATION AND TREATMENT OF 2000 CUBIC YARDS OF SOIL. THE USE OF A MOBILE UNIT HAS THE ADVANTAGE OF NO CAPITAL INVESTMENTS, AND SINCE COMPLETE DESTRUCTION OF THE WASTE IS ACHIEVED, NO OPERATION AND MAINTENANCE COSTS ARE INCURRED BEYOND THE FIRST YEAR. OVERALL COST FOR SOIL EXCAVATION, TREATMENT BACKFILLING AND PERIODIC SAMPLING IS ESTIMATED AT $ 895,700.

THE TOTAL PRESENT WORTH COST OF THIS REMEDY, INCLUDING BOTH SOIL AND GROUNDWATER REMEDIATION, IS $2,098,900.

6.4 SCHEDULE

THE PLANNED SCHEDULE FOR REMEDIAL ACTIVITIES AT THE WAMCHEM SITE WILL BE GOVERNED BY THE SIGNING OF THE CONSENT DECREE, BUT TENTATIVELY IS AS FOLLOWS;

JUNE 1988 - APPROVE RECORD OF DECISION
SEPTEMBER 1988 - SIGN CONSENT DECREE
OCTOBER 1988 - BEGIN REMEDIAL DESIGN
MARCH 1989 - COMPLETE REMEDIAL DESIGN
MAY 1989 - BEGIN MOBILIZATION

6.5 FUTURE ACTIONS

GROUNDWATER MONITORING WILL BE REQUIRED THROUGHOUT THE REMEDIAL ACTIVITIES TO ASSURE THE EFFECTIVENESS OF THE GROUNDWATER CLEANUP.

6.6 CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

REMEDIAL ACTIONS PERFORMED UNDER CERCLA MUST COMPLY WITH ALL APPLICABLE FEDERAL AND STATE

REGULATIONS. ALL ALTERNATIVES CONSIDERED FOR THE WAMCHEM SITE WERE EVALUATED ON THE BASIS OF THE DEGREE TO WHICH THEY COMPLIED WITH THESE REGULATIONS. THE RECOMMENDED ALTERNATIVES WERE FOUND TO MEET OR EXCEED ALL APPLICABLE ENVIRONMENTAL LAWS, AS DISCUSSED BELOW;

- RESOURCE CONSERVATION AND RECOVERY ACT

  THE LTTA PROCESS FOR SOILS DOES NOT MEET THE DEFINITION OF AN INCINERATOR UNDER RCRA AND THEREFORE IS NOT SUBJECT TO INCINERATOR PERFORMANCE STANDARDS.

- CLEAN WATER ACT

  TRACE AMOUNTS OF CONTAMINATION WERE DETECTED IN SEDIMENTS IN MCCALLEYS CREEK. THE SOIL AND GROUNDWATER REMEDIATION WILL DELETE THE SOURCE OF ANY FUTURE CONTAMINATION. AWQC FOR THE PROTECTION OF SALTWATER AQUATIC LIFE HAVE BEEN USED IN THE DEVELOPMENT OF REMEDIAL ACTION.

- FLOODPLAIN MANAGEMENT EXECUTIVE ORDER 11988

  THE SITE IS LOCATED WITHIN THE 100-YEAR FLOODPLAIN AND SUBJECT TO THE REQUIREMENTS OF E.O. 11988. ANY HAZARDOUS WASTE STORAGE OR TREATMENT FACILITIES MUST BE PROTECTED FROM THE LOO-YEAR FLOOD.

- DEPARTMENT OF TRANSPORTATION

  TRANSPORTATION OF HAZARDOUS SUBSTANCES IS REGULATED BY THE DEPARTMENT OF TRANSPORTATION. THE ALTERNATIVE CHOSEN DOES NOT INVOLVE TRANSPORTATION OF HAZARDOUS WASTE.

- OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

  A HEALTH AND SAFETY PLAN WILL BE DEVELOPED DURING REMEDIAL DESIGN AND WILL BE FOLLOWED DURING THE FIELD ACTIVITIES TO ASSURE THAT REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) ARE FOLLOWED.

- SAFE DRINKING WATER ACT

  DRINKING WATER STANDARDS (MCL'S, MCLG'S) ARE NOT APPLICABLE.

- NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

  DISCHARGE OF TREATED GROUNDWATER IS PART OF THE RECOMMENDED ALTERNATIVE. THIS DISCHARGE WILL MEET EFFLUENT LIMIT REQUIREMENTS OF THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES). AQUATIC LIFE CHRONIC TOXICITY VALUES, WHICH ARE USED IN THE NPDES PERMITTING SYSTEM, WERE USED IN DETERMINING THE GROUNDWATER CLEANUP GOALS IN SECTION 4.

- ENDANGERED SPECIES ACT

- THE RECOMMENDED REMEDIAL ALTERNATIVE IS PROTECTIVE OF SPECIES

  LISTED AS ENDANGERED OR THREATENED UNDER THE ENDANGERED SPECIES ACT. REQUIREMENTS OF THE INTERAGENCY SECTION 7 CONSULTATION PROCESS, 50 CFR, PART 402, WILL BE MET. THE DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE AND NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), WILL BE CONSULTED DURING REMEDIAL DESIGN TO ASSURE

THAT ANY ENDANGERED OR THREATENED SPECIES ARE NOT ADVERSELY IMPACTED BY IMPLEMENTATION OF THIS REMEDY.

- AMBIENT AIR QUALITY STANDARDS

  THE SOIL AND GROUNDWATER TREATMENT SYSTEMS WILL BE DESIGNED AND MONITORED TO ASSURE THAT AIR EMISSIONS MEET ALL STATE AND FEDERAL STANDARDS.

- STATE DRINKING WATER STANDARDS

  MAXIMUM CONTAMINANT LEVELS ESTABLISHED BY THE STATE OF SOUTH CAROLINA ARE NOT APPLICABLE TO THE SITE.

#CR

7.0 COMMUNITY RELATIONS

FACT SHEETS WERE TRANSMITTED TO INTERESTED PARTIES, RESIDENTS NEAR THE SITE, MEDIA AND STATE, LOCAL AND FEDERAL OFFICIALS BEFORE THE RI WORK BEGAN AT THE SITE IN JULY 1986.

AN INFORMATION REPOSITORY WAS ESTABLISHED AT THE BEAUFORT COUNTY LIBRARY IN BEAUFORT, SOUTH CAROLINA.

A FACT SHEET DESCRIBING THE RESULTS OF THE RI WAS TRANSMITTED TO INTERESTED PARTIES IN AUGUST, 1987.

A PUBLIC NOTICE WAS PUBLISHED IN THE BEAUFORT GAZETTE ON MAY 6, 1988. THIS NOTICE ANNOUNCED THE BEGINNING OF THE PUBLIC COMMENT PERIOD AND REQUESTED ANY PERSONS DESIRING A PUBLIC MEETING TO CONTACT THE EPA PROJECT MANAGER.

NO COMMENTS WERE RECEIVED DURING THE THREE-WEEK PUBLIC COMMENT PERIOD WHICH ENDED JUNE 6, 1988.

#TAB

TABLE 1

RESULTS OF ANALYSIS OF SOILS COLLECTED
AUGUST 1986 (UG/KG)

COMPOUND	SO-18	SO-20	SO-21	SO-30	SO-45
METHYTLENE CHLORIDE	20B	1300JB	11B	49B	76B
ACETONE	33B		100	36B	81B
2-BUTANONE			53		
BENZENE			1.4J		1.7JB
TOLUENE		12000J	20		
TOTAL XYLENE		720,000	290	48	
PHENOL	68J				
1,2-DICHLORO BENZENE		11,000J		130J	
BENZOIC ACID	170J				
1,2,4-TRICHLORO BENZENE		18000J		29000	
NAPTHALENE		4000J			
2,4-DINITRO TOLUENE	100J	480000	53000		
DI-N-BUTYL PHTHALATE					81JB
BIS(2-ETHYL-HEXYL)PHTHALATE	68J				340JB
1,4 DICHLORO BENZENE		35,000			

J - INDICATES AN ESTIMATED VALUE.
B - ANALYTE WAS FOUND IN THE BLANK AS WELL AS THE SAMPLE.

TABLE 2

SOIL SAMPLE ANALYSIS RESULTS (UG/KG)

	S020A	S020B	S020C	S021A	S021B	S021C
METHYLENE CHLORIDE	25B	1300JB	5200B	10B	11B	48B
ACETONE	---	---	11000B	11B	100	260B
1,2 DICHLOROETHANE	---	---	---	---	---	11
2-BUTANONE	---	---	---	---	53	220
BENZENE	---	---	---	---	1.4J	2.0J
TETRACHLOROETHENE	---	---	2500J	---	---	6.7U
TOLUENE	---	12000J	21000	---	20	72
CHLOROBENZENE	---	---	---	---	---	13
ETHYL BENZENE	---	---	1100J	---	---	9.1
TOTAL XYLENE	---	720000	140000	---	290	370
PHENOL	---	---	---	---	---	830
1,4-DICHLOROBENZENE	---	3500	720000	---	---	2400
1,2-DICHLOROBENZENE	---	11000J	110000	---	---	3400
NITROBENZENE	---	---	---	---	---	600
2-NITROPHENOL	---	---	---	---	---	7100
2,4-DIMETHYL PHENOL	---	---	---	---	---	---
BENZOIC ACID	50J	---	---	---	---	1400J
2,4-DICHLOROPHENOL	---	---	4400J	---	---	100J
1,2,4-TRICHLOROBENZENE	---	18000J	460000	---	---	660
NAPHTHALENE	---	4000J	---	---	---	---
4-CHLORO 3-ETHYL PHENOL	---	---	---	---	---	---
2,4-DINITROPHENOL	---	---	---	---	---	4400
2,4-DINITROTOLUENE	---	480000	100000	---	53000	6600
4-NITROPHENOL	---	---	---	---	---	1400JD
BIS(2-ETHYLHEXYL)PHTHALATE	54J	---	3600J	---	---	---

TABLE 2 (CONTINUED)
SOIL SAMPLE ANALYSIS RESULTS (UG/KG)

	S030A	S030B	S047A	S047B	S047C
METHYLENE CHLORIDE	---	28B	16B	12B	22B
ACETONE	36B	70B	20B	17B	92B
1,2 DICHLOROETHANE	---	---	---	---	---
2-BUTANONE	---	6.2J	---	---	---
BENZENE	---	---	---	---	1.3JB
TETRACHLOROETHENE	---	---	---	---	---
TOLUENE	---	2.1J	9.7	---	---
CHLOROBENZENE	---	---	---	---	---
ETHYL BENZENE	---	---	---	---	---
TOTAL XYLENE	---	48	250	2.9J	---
PHENOL	---	280J	91J	---	---
1,4-DICHLOROBENZENE	---	84J	1100	---	---
1,2-DICHLOROBENZENE	1300J	290J	---	---	---
NITROBENZENE	---	---	---	---	---
2-NITROPHENOL	---	---	---	---	---
2,4-DIMETHYL PHENOL	---	---	95J	---	---
BENZOIC ACID	---	---	470J	---	---
2,4-DICHLOROPHENOL	---	95J	660	160J	420J
1,2,4-TRICHLOROBENZENE	29000	4200	5200	---	---
NAPHTHALENE	---	46J	---	---	---
4-CHLORO 3-ETHYL PHENOL	---	93J	---	---	---
2,4-DINITROPHENOL	---	---	---	---	---
2,4-DINITROTOLUENE	---	---	---	3300	240J
4-NITROPHENOL	---	---	---	---	---
BIS(2-ETHYLHEXYL)PHTHALATE	---	---	---	---	---

TABLE 2 (CONTINUED)
SOIL SAMPLE ANALYSIS RESULTS (UG/KG)

	S048A	S048B	S048C	S049A	S049B	S049C
METHYLENE CHLORIDE	18B	14B	29B	18B	17B	20B
ACETONE	6.9JB	60B	44B	37B	22B	37B
CHLOROFORM	---	---	1.7J	---	---	11
2-BUTANONE	---	---	---	---	---	---
TOLUENE	---	9.6	5.5J	---	---	32
1,1,2,2-TETRACHLOROETHANE	---	---	15	---	---	14
CHLOROBENZENE	---	---	---	---	---	3.6J
TOTAL XYLENE	6.5	---	25	---	9.4	150
ETHYL BENZENE	---	---	---	---	---	---
PHENOL	---	79J	48J	100J	---	110J
1,4-DICHLOROBENZENE	1800	2500	220J	---	---	74J
1,2-DICHLOROBENZENE	---	100J	96J	---	---	---
4-METHYLPHENOL	---	---	---	---	59J	---
2,4-DICHLOROBENZENE	610	7400D	130J	---	---	---
1,2,4-TRICHLOROBENZENE	12000D	11000D	270J	670	110J	190J
2-NITROPHENOL	---	---	---	---	---	---
BENZOIC ACID	---	---	---	---	---	---
4-NITROPHENOL	---	---	---	---	---	---
2,4 DINITROTOLUENE	1600	1400	3300	150J	120J	3200
4-NITROANILINE	---	---	---	---	---	---
PENTACHLOROPHENOL	---	---	---	---	---	---
DI-NI-BUTYL PHTHALATE	100J	79J	---	---	---	---
PYRENE	---	---	---	---	---	---
BIS(2-ETHYLHEXYL)PHTHALATE	---	---	---	63J	---	---
4-CHLOROANILINE	78J	---	---	---	---	---
2,4,5-TRICHLOROPHENOL	---	390	---	---	---	---
2,4 DINITROPHENOL	---	---	160J	---	---	---

TABLE 2 (CONTINUED)
SOIL SAMPLE ANALYSIS RESULTS (UG/KG)

	S050A	S050B	S050C	S051A	S051B	S051C
METHYLENE CHLORIDE	320B	24B	16B	14B	19B	550JB
ACETONE	13B	130B	71B	50B	75B	140B
CHLOROFORM	---	---	---	---	---	---
2-BUTANONE	---	---	---	---	---	45
TOLUENE	2.7J	9.7	1.7J	5.8	---	---
1,1,2,2-TETRACHLOROETHANE	---	---	---	---	---	---
CHLOROBENZENE	---	2.4J	---	---	---	---
TOTAL XYLENE	---	80	25	81	28	3.4J
ETHYL BENZENE	---	1.9J	---	---	---	---
PHENOL	---	360J	---	---	180J	130J
1,4-DICHLOROBENZENE	180J	310J	250J	160J	160J	---
1,2-DICHLOROBENZENE	70J	150J	140J	410	440J	---
4-METHYLPHENOL	---	---	---	---	---	---
2,4-DICHLOROBENZENE	---	76J	---	54J	93J	---
1,2,4-TRICHLOROBENZENE	1200	410J	630	8900D	1900	---
2-NITROPHENOL	---	290J	---	---	---	---
BENZOIC ACID	---	770J	---	230J	---	3000
4-NITROPHENOL	---	---	---	54J	---	---
2,4 DINITROTOLUENE	170J	6300	75J	330J	---	---
4-NITROANILINE	---	---	---	320J	520J	1200J
PENTACHLOROPHENOL	---	55J	---	---	---	---
DI-NI-BUTYL PHTHALATE	44J	---	---	---	---	---
PYRENE	40J	---	---	---	---	---
BIS(2-ETHYLHEXYL)PHTHALATE	---	59J	41J	---	---	---
4-CHLOROANILINE	---	---	---	---	---	---
2,4,5-TRICHLOROPHENOL	---	---	---	---	---	---
2,4 DINITROPHENOL	---	---	---	---	---	---

TABLE 2 (CONTINUED)
SOIL SAMPLE ANALYSIS RESULTS (UG/KG)

	S052A	S052B	S052C	S053A	S053B	S053C	S054A
METHYLENE CHLORIDE	550JB	13B	15B	12B	22B	49B	42B
ACETONE	1600	270B	82B	42B	100B	130B	7.3JB
TRANS-1,2 DICHLOROETHENE	---	7.2	---	---	---	---	---
CHLOROFORM	---	---	---	---	---	5.8J	2.6J
2-BUTANONE	---	---	83	---	11J	22	---
TETRACHLORO-ETHENE	---	4.2J	---	---	---	---	---
TOLUENE	---	66	30	9.0	2.1J	1.5J	---
CHLOROBENZENE	---	2.3J	3.2J	1.7J	---	---	---
ETHYL BENZENE	---	2.6J	2.9J	3.3J	---	---	---
TOTAL XYLENE	---	690	200	200	48	---	---
PHENOL	---	1500	260J	---	---	460	---
1,4-DICHLORO-BENZENE	---	190J	650	820	150J	140J	---
1,2-DICHLORO-BENZENE	---	420J	2400	600	140J	91J	---
4-METHYLPHENOL	---	---	---	---	---	---	---
NITROBENZENE	---	---	260J	2400	---	---	---
2-NITROPHENOL	---	120J	150J	---	---	---	---
2,4-DIMETHYL PHENOL	---	3300	57J	82J	---	---	---
BENZOIC ACID	---	---	1100J	450J	---	63J	---
2,4-DICHLORO-PHENOL	---	---	61J	540	---	---	---
1,2,4-TRICHLO-ROBENZENE	---	1000	2500	440000D	7400	17000D	130J
NAPHTHALENE	---	200J	---	---	---	---	---
2-METHYLNAPH-THALENE	---	---	---	---	---	---	---
2,4,6-TRICHLO-ROPHENOL	---	---	---	800	---	---	---
2,4,5-TRICHLO-ROPHENOL	---	---	41J	800J	---	---	---
2,4 DINITRO-TOLUENE	---	160000D	9800D	1700	3400	890	---
4-NITROANILINE	---	---	5000	---	---	---	---
HEXACHLORO-BENZENE	---	370J	---	---	---	---	---
PENTACHLO-OPHENOL	---	510J	---	---	---	---	---
PHENANTHRENE	---	850	---	---	---	---	---
DI-N-BUTYL PHTHALATE	---	370J	---	---	---	---	---
FLUORANTHENE	---	1100	---	---	---	---	---
PYRENE	---	250J	---	---	---	---	---
3,3-DICHLORO BENZIDINE	---	---	69J	---	---	---	---
BIS(2-ETHYLHOXYL) PHTHALATE	---	2700	69J	71J	61J	---	---
CHRYSENE	---	---	---	---	---	---	---
TETRACHLORO-ETHENE	---	430	540D	---	---	---	---

TABLE 2 (CONTINUED)
SOIL SAMPLE ANALYSIS RESULTS (UG/KG)

	S054B	S054C	S055A	S055B	S055C	S056A
METHYLENE CHLORIDE	36B	65B	26B	22B	7.6B	14B
ACETONE	67B	220B	170B	54B	180B	7JB
TRANS-1,2 DICHLOROETHENE	---	---	---	---	---	---
CHLOROFORM	29D	---	---	---	---	2J
2-BUTANONE	---	35	---	---	---	---
TETRACHLORO-ETHENE	---	---	---	---	---	---
TOLUENE	36	1.9J	---	---	---	1J
CHLOROBENZENE	3.2J	---	---	---	---	---
ETHYL BENZENE	---	---	---	---	---	---
TOTAL XYLENE	1800D	---	9.9	---	---	---
PHENOL	2300	250J	120J	83J	76J	---
1,4-DICHLORO-BENZENE	660J	120J	410J	120J	50J	---
1,2-DICHLORO-BENZENE	560J	81J	440J	140J	55J	---
4-METHYLPHENOL	---	68J	---	---	---	---
NITROBENZENE	---	---	---	90J	---	---
2-NITROPHENOL	---	---	---	---	---	---
2,4-DIMETHYL PHENOL	1400	51J	---	---	---	---
BENZOIC ACID	---	310J	460J	---	---	---
2,4-DICHLORO-PHENOL	---	51J	240J	---	---	---
1,2,4-TRICHLO-ROBENZENE	1800	64J	86000D	16000D	1000	---
NAPHTHALENE	1800	---	---	---	---	---
2-METHYLNAPH-THALENE	740J	---	---	---	---	---
2,4,6-TRICHLO-ROPHENOL	---	---	---	---	---	---
2,4,5-TRICHLO-ROPHENOL	---	---	---	---	---	---
2,4 DINITRO-TOLUENE	300000D	1700	750	320J	980	---
4-NITROANILINE	---	---	---	---	---	---
HEXACHLORO-BENZENE	---	---	---	---	---	---
PENTACHLO-OPHENOL	---	---	---	---	---	---
PHENANTHRENE	---	---	---	---	---	---
DI-N-BUTYL PHTHALATE	---	---	---	---	---	---
FLUORANTHENE	1000J	---	---	---	---	---
PYRENE	1500	---	---	---	---	---
3,3-DICHLORO BENZIDINE	---	---	---	---	---	---
BIS(2-ETHYLHOXYL) PHTHALATE	12000	98J	68J	41J	71J	98J
CHRYSENE	1400	---	---	---	---	---
TETRACHLORO-ETHENE	2.2J	---	---	---	---	---

TABLE 2 (CONTINUED)
SOIL SAMPLE ANALYSIS RESULTS (UG/KG)

	S058A	S061A	S061B	S061C	S062A	S062B
METHYLENE CHLORIDE	20B	27B	20B	15B	17B	44B
ACETONE	---	11BJ	49	43	24B	47B
CHLOROFORM	---	---	---	4J	1J	---
2-BUTANONE	---	---	---	---	---	---
TOLUENE	---	---	---	---	---	---
CHLOROBENZENE	---	---	---	---	---	---
TOTAL XYLENE	---	---	---	---	---	7
PHENOL	---	---	---	---	---	---
1,4-DICHLOROBENZENE	---	---	---	---	---	270J
1,2-DICHLOROBENZENE	---	---	---	---	120J	6300
2,4-DICHLOROBENZENE	830	---	---	---	---	---
1,2,4-TRICHLOROBENZENE	2800	---	---	---	---	1300
4-NITROPHENOL	---	---	---	---	---	---
2,4-DINITROTOLUENE	610	---	---	---	---	---
DI-N-BUTYLPHTHALATE	---	---	---	65J	---	---
FLUORANTHENE	40J	---	---	---	---	---
PYRENE	49J	---	---	---	---	---
BIS(2-ETHYLHOXYL) PHTHALATE	---	---	---	---	---	---
DI-N-OCTYL PHTALATE	---	---	---	---	---	---

TABLE 2 (CONTINUED)
SOIL SAMPLE ANALYSIS RESULTS (UG/KG)

	S062C	S063A	S064A	S064B	S064C	S065A
METHYLENE CHLORIDE	31B	22B	27B	53B	33B	13B
ACETONE	100	32B	40B	60B	270E	32B
CHLOROFORM	3J	---	---	7JB	---	---
2-BUTANONE	---	---	---	---	91	---
TOLUENE	4J	33	110	3J	10	3J
CHLOROBENZENE	3J	2J	---	---	---	1J
TOTAL XYLENE	9	630E	240	49	35	33
PHENOL	---	---	---	---	110J	---
1,4-DICHLOROBENZENE	89J	400	290J	270J	71J	---
1,2-DICHLOROBENZENE	1500	440	---	710	170J	---
2,4-DICHLOROBENZENE	---	160J	160J	160J	53J	---
1,2,4-TRICHLOROBENZENE	72J	---	82J	---	---	4200
4-NITROPHENOL	---	---	490J	---	100J	---
2,4 DINITROTOLUENE	---	---	---	200J	97J	---
DI-N-BUTYLPHTHALATE	---	---	---	---	---	---
FLUORANTHENE	---	---	---	---	---	---
PYRENE	---	---	---	---	---	---
BIS(2-ETHYLHOXYL) PHTHALATE	---	---	---	---	---	83J
DI-N-OCTYL PHTALATE	---	---	---	---	---	—

TABLE 2 (CONTINUED)
SOIL SAMPLE ANALYSIS RESULTS (UG/KG)

	S066A	S066B	S066C	S068A
METHYLENE CHLORIDE	38B	22B	28D	17B
ACETONE	27B	48B	150B	13JB
CHLOROFORM	---	---	---	---
2-BUTANONE	---	---	---	---
TOLUENE	---	---	---	---
CHLOROBENZENE	---	---	---	---
TOTAL XYLENE	---	---	---	---
PHENOL	---	---	---	---
1,4-DICHLOROBENZENE	---	---	---	---
1,2-DICHLOROBENZENE	---	---	---	---
2,4-DICHLOROBENZENE	---	110J	---	---
1,2,4-TRICHLOROBENZENE	470	380J	---	---
4-NITROPHENOL	---	---	---	---
2,4 DINITROTOLUENE	---	---	---	---
DI-N-BUTYLPHTHALATE	---	---	---	---
FLUORANTHENE	---	---	---	---
PYRENE	---	---	---	---
BIS(2-ETHYLHOXYL) PHTHALATE	42J	---	---	---
DI-N-OCTYL PHTALATE	---	---	110J	---

TABLE 3

SEDIMENT ANALYSIS RESULTS
AUGUST 1986 (UG/KG)

COMPOUND	SE-1	SE-2	SE-3	SE-4	SE-5	SE-6	SE-7
METHYLENE CHLORIDE	29 B	20 B	59	71	42	92	20 B
ACETONE	20 B	22 B	26	51	10J	60	18 B
CARBON DISULFIDE				2.4J			
CHLOROFORM		9.8					
BENZENE			1.9J				
TOLUENE					1.9J		
CHLOROBENZENE			180				
1,4 DICHLORO-BENZENE			190J				
1,2 DICHLORO-BENZENE			240J				
PYRENE			220J				

TABLE 4

RESULTS OF BUILDING WIPE SAMPLES
AUGUST, 1986 NG/SAMPLE

	BUILDING								
COMPOUND	1	2	3	4	5	6	7	8	9
DIETHYL-PHTHALATE			2J	2.2J	2.8J				3.6J
DI-N-BUTYL-PHTHALATE	4.3JB		12JB	16JB	12JB	13JB	9.1JB	19JB	17JB
BUTYL BERYL-PHTHALATE	7.7J	5300	4.7J						
BIS(2-ETHYLHEXYL) PHTHALATE	4.9JB		7.3JB	3.2JB	6.7JB	2.6JB			

B - ANALYTE WAS FOUND IN THE BLANK AS WELL AS THE SAMPLE. IT INDICATES POSSIBLE OR PROBABLE BLANK CONTAMINATION.

J - INDICATES AN ESTIMATED VALUE.

TABLE 5

GROUNDWATER ANALYSIS OF ONSITE WELLS (UG/L)
AUGUST 1986

COMPOUND	RI-1A	RI-3A	RI-7A	RI-1B	RI-2	RI-3B	RI-4	RI-5	RI-6	RI-7B
METHYLENE-CHLORIDE	-	-	-	-	-	-	1.5J	830JB	1.1J	3.9J
ACETONE	-	-	-	-	-	-	6.6B	68000B	-	-
BENZENE	-	-	-	-	-	12	-	2100	55	-
TOLUENE	-	-	-	-	-	-	-	3900	1.5J	-
CHLORO-BENZENE	-	-	-	-	-	-	-	-	15	-
ETHYL BEN-ZENE	-	-	-	-	-	-	-	-	2.1J	-
TOTAL XYLENE	-	-	-	-	-	40	2.3J	4500	4.2J	-
BIS(2-CHLORO-ETHYL)ETHER	-	-	-	-	-	-	-	23	-	-
1,3 DICHLORO BENZENE	-	-	-	-	-	-	-	-	2J	-
1,4-DICHLORO BENZENE	-	-	-	-	-	-	-	-	19J	-
1,2-DICHLORO BENZENE	-	-	-	-	-	-	-	-	19J	-
4-METHYLPHENOL	-	-	-	-	-	-	-	-	4.4J	-
ISOPHORONE	-	-	-	-	-	-	-	300	-	-
4-CHLOROANILINE	-	-	-	-	-	-	-	-	4.4J	-
DI-N-BUTHYL PHTHALATE	-	-	-	-	-	-	5.4J	-	-	-
BIS(2ETHYLHEXYL) PHTHALATE	-	-	-	-	-	-	3.2J	-	-	-

" - " - UNDETECTED

TABLE 6

GROUNDWATER ANALYSIS OF OFFSITE WELLS (UG/L)
AUGUST 1986

COMPOUND	RI-9	RI-11	RI-12	RI-13	RI-14	RI-19	RI-20	RI-21	RI-22	RI-23
METHLENE CHLORIDE	-	-	-	-	1.3J	-	1.2J	-	-	-
DI-N-OCTYL PHTHALATE	-	-	-	-	-	-	-	-	-	3.2J

TABLE 7

GROUNDWATER CLEANUP GOALS

COMPOUND	CLEANUP GOAL MG/L
ACETONE	1000A
BENZENE	0.70
1,2 - DICHLOROBENZENE	1.97
1,4 - DICHLOROBENZENE	1.97
2,4 - DINITROTOLUENE	0.37
NAPTHALENE	2.35
TOLUENE	5.00
1, 2, 4 - TRICHLOROBENZENE	0.129A
TOTAL XYLENE	2.0

GOALS BASED UPON USEPA AMBIENT WATER QUALITY CRITERIA FOR AQUATIC ORGANISMS.

A - NO AWQC AVAILABLE. GOAL BASED UPON A GENERAL AQUATIC RATING ASSIGNED BY THE REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES, 1982.

TABLE 8

SOIL CLEANUP GOALS

COMPOUND	CLEANUP GOAL (MG/KG)
ACETONE	97.81
BENZENE	2.43
1,2 - DICHLOROBENZENE	33.43
1,4 - DICHLOROBENZENE	38.06
2,4 - DINITROTOLUENE	3.62
NAPHTHALENE	74.57
TOLUENE	34.47
1,2,4 - TRICHLOROBENZENE	4.23
TOTAL XYLENE	67.58

TABLE 9

REMEDIAL ALTERNATIVES FOR GROUNDWATER AND SOIL

GROUNDWATER--GENERAL RESPONSE ACTIONS

- I. NO ACTION
- II. CONTAINMENT
  - A. CAPPING
  - B. SUBSURFACE BARRIERS
  - C. ACCESS LIMITATIONS
- III. COLLECTION/CONTROL
  - A. PUMPING
  - B. SUBSURFACE DRAINS
- IV. TREATMENT
  - A. BIOLOGICAL TREATMENT
  - B. CHEMICAL TREATMENT
  - C. PHYSICAL TREATMENT

SOILS--GENERAL RESPONSE ACTIONS

- I. NO ACTION
- II. CONTAINMENT
  - A. CAPPING
  - B. GRADING
  - C. REVEGETATION
- III. DISPOSAL
  - A. EXCAVATION AND REMOVAL
  - B. OFFSITE DISPOSAL
  - C. ONSITE LAND DISPOSAL
- IV. IN-SITU TREATMENT
  - A. BIORECLAMATION
  - B. CHEMICAL TREATMENT
- V. DIRECT TREATMENT
  - A. BIOLOGICAL TREATMENT
  - B. CHEMICAL TREATMENT
  - C. PHYSICAL TREATMENT